SECOND SEMI-ANNUAL REMEDIAL ACTION STATUS REPORT FOR 2000
NATIONAL ELECTRIC COIL SITE
HARLAN COUNTY, KENTUCKY

Prepared for:
COOPER INDUSTRIES
HOUSTON, TEXAS

March 9, 2001

CEC Project 200658

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1.0 INTRODUCTION

1.1 SITE LOCATION

The National Electric Coil (NEC) facility is situated on approximately four acres of land and is located in Dayhoit, Harlan County, Kentucky, shown on Figure 1. The facility is bordered on the west by former U.S 119, on the east by the Cumberland River, on the north by an emergency utility substation, and on the south by a trailer park property. The facility is surrounded by a chain-link fence, and is occupied by a main plant building, several smaller storage buildings, and a boiler house, shown on Figure 2. Figure 3 shows the site vicinity, including the offsite properties and the location of the Cumberland River that flows generally east to west.

1.2 SITE HISTORY

The facility was originally opened in 1951 by the McGraw-Edison Company (McGraw-Edison) and operated as a rebuilding and remanufacturing facility for coal mining and related industrial equipment including electric motors, rewinding electric coils, manufacturing, general machine shop work, and mining equipment repair. McGraw-Edison owned and operated the facility until 1985 when Cooper Industries (Cooper) purchased McGraw-Edison as a wholly-owned subsidiary. McGraw-Edison continued to operate the NEC facility until August 1987. The Treen Land Company of Brookside, Kentucky purchased the NEC building and property in August of 1987 and the operations were reopened as the National Electric Service Company. The facility operates under the National Electric Services Management Group, owned by Charles Dozier, for electrical motor repair work and limited rebuilding of hydraulic systems for the coal industry.

1.3 SITE ENVIRONMENTAL ACTIONS

In October 1990, the United States Environmental Protection Agency (USEPA) issued a Unilateral Administrative Order (UAO) (USEPA Docket No. 90-57-C) requiring immediate actions designed to mitigate the release of hazardous substances from the site. Cooper subsequently contracted with Law Engineering & Environmental Services (Law) to develop and implement a Remedial Action Plan (RAP) in accordance with the USEPA's UAO. As part of the RAP, Law installed monitoring wells at the site to evaluate the magnitude of the groundwater contamination.

The NEC site was proposed for inclusion on the National Priority List (NPL) on July 29, 1991 and the site was placed on the NPL on October 14, 1992. USEPA and Cooper entered into an Administrative Order by Consent for a Remedial Investigation/Feasibility Study (RI/FS) in May 1992. The USEPA issued a UAO on December 15, 1992, directing Cooper to perform the Interim Remedial Design/ Interim Remedial Action (RA), described in the Record of Decision (ROD), concurrently with the RI/FS to capture groundwater containing chlorinated volatile organic compounds (VOCs).

The original groundwater recovery and treatment system was activated in July 1993 and consisted of an on-site Recovery Well CMW-5-11 located in the deeper bedrock aquifer zone (at an approximate depth of 120 feet), an equalization tank, an air stripping tower, and a 10,000 pound activated carbon unit to treat the air stripper offgas.

An additional RA was implemented at the site to address impacted groundwater in accordance with the April 26, 1996 ROD and the May 20, 1996 UAO issued to

Cooper by the USEPA. A RA Report (March 4, 1998) was submitted to document the implementation and initial start-up activities associated with the RA system. The RA system consisted of the installation of groundwater recovery systems located in the shallow alluvial aquifer and the intermediate and deeper zones of the underlying bedrock aquifer, and the installation of a treatment system to remove the VOCs from the extracted groundwater using air stripping technology. The air stripper offgases are treated through a catalytic oxidation system prior to being discharged into the atmosphere via a 60-foot tall air stack.

The final groundwater recovery system consisted of the installation of four recovery units: an interceptor trench located in the shallow alluvial aquifer (approximately 190 feet long and 24 feet deep); Recovery Well R-2 located in the intermediate bedrock aquifer zone (approximately 80 feet deep); Recovery Well CMW-5-2A located in the deeper bedrock aquifer zone (approximately 125 feet deep); and existing Recovery Well CMW-5-11 (approximately 120 feet deep) located in the deeper bedrock aquifer zone.

The final groundwater treatment system consisted of a 2,000-gallon double-walled equalization tank, the existing air stripper tower, and a catalytic oxidation system to treat the offgases from the air stripping tower. Treated water flowing at an average of 150 to 180 gallons per minute (gpm) from the air stripper continues to be discharged to the Cumberland River in compliance with the requirements of a KPDES permit. The layout of the remediation system is shown on Figure 2.

The final RA implementation was conducted between September 1997 and February 1998. The final groundwater recovery systems and the catalytic oxidation unit started up in February 1998.

1.4 CONTAMINANTS OF CONCERN

Historically, several VOCs have been detected in the groundwater samples collected from the site, however the contaminants with the highest concentrations detected include cis-1,2-dichloroethene (DCE), trichloroethene (TCE), and vinyl chloride. Tetrachloroethene (PCE), 1,1-DCE, benzene, 1,1,2,2-tetrachloroethane, and toluene have also been detected in the past at elevated concentrations in some wells. The contaminants of concern and their respective maximum contaminant levels (MCLs) are listed below:

Contaminant	MCL (μg/l)
TCE	5
Cis-1,2-DCE	70
Vinyl Chloride	2
1,1-DCE	7
PCE	5
Benzene	5
Toluene	1,000

No MCL exists for 1,1,2,2-tetrachloroethane.

2.0 SEMIANNUAL ACTIVITIES

2.1 SYSTEM OPERATION AND MAINTENANCE

Civil & Environmental Consultants, Inc. (CEC) and Eastern Well and Pump conducted routine monthly monitoring of the groundwater remediation system. The operations and maintenance of the groundwater remediation system are performed by Eastern Well & Pump. Table 1 summarizes the maintenance conducted from July through December 2000. No major problems were encountered during the period. Major activities included repairs to instrumentation, disinfecting the receiving wells with bleach, and routine maintenance of the equipment.

2.2 INFLUENT AND EFFLUENT WATER SAMPLING

Operation of the remediation system is subject to federal and state requirements. The KYDEP Water Resources Branch, Division of Water, in a letter dated March 6, 1996, set forth the requirements for the NEC site for the pumping of groundwater from the three aquifer zones. The authorization letter permits total recovery rates to a maximum of 250 gpm (0.360 mgd) from all of the aquifer zones. The groundwater recovery system is typically pumped at an approximate combined average rate of approximately 150 to 180 gpm, with an average of 167 gpm for the reporting period.

Monitoring of the discharged groundwater has continued during the operation of the RA to demonstrate continued compliance with the KPDES requirements. A KPDES permit was granted for the discharge of water from the treatment system and is effective from February 1, 1997 through February 1, 2002. A modified permit was issued by the KYDEP on December 20, 1999, which became effective on

February 1, 2000. The modified permit allows monthly monitoring of the effluent water, eliminates the need for PCB analysis, and eliminates the need for the diffuser pipe. The new permit establishes discharge limitations and monitoring and reporting requirements (Table 2).

Influent and effluent samples were collected once to twice monthly to monitor the treatment efficiency of the air stripper. A total of eight samples were collected during the second half of 2000. Samples were analyzed for VOCs by Antech Ltd. using USEPA Method 8260.

2.3 INFLUENT AND EFFLUENT AIR EMISSION SAMPLING

The KYDEP has not established limits for air emissions from the treatment system and does not require an air permit. However, the USEPA has developed emission rates and ambient air performance standards for the RA system as follows:

1,2-DCE	5,5850,000 ppbv
TCE	19,600 ppbv
Vinyl Chloride	837 ppbv

Performance standards were established in the ROD, with limitations on the discharge of TCE, cis-1,2-DCE, and vinyl chloride. The point of compliance for the emission rate standards is the discharge end of the 60-foot air exhaust stack, after the catalytic oxidation unit.

The air emissions exiting the air exhaust stack were monitored during the initial start up of the RA system to demonstrate compliance of the offgas catalytic oxidation treatment system with the USEPA emission rate performance standards.

Monitoring of the air exhaust emissions exiting the stack has continued on a monthly basis during the operation of the RA to demonstrate continued compliance with USEPA's air emission performance standards.

The groundwater recovery offgas treatment system operated continuously during the second semiannual period. Influent air was sampled quarterly, and effluent air was sampled monthly during the reporting period. Samples were collected in Summa canisters with flow-control valves and analyzed by Severn Trent in Houston, Texas, for VOCs using USEPA Method TO-14 (Appendix A).

2.4 GROUNDWATER SAMPLING

Cooper conducts routine groundwater monitoring on a semiannual basis. The purpose of these activities is to evaluate the concentrations of VOCs in groundwater with respect to time, and to measure the effectiveness of the groundwater recovery and treatment system. The groundwater monitoring system for the NEC site is summarized in Table 3.

The second semiannual sampling event was conducted on October 11 and 12, 2000 by CEC. Activities included water level measurement in 21 wells and the collection of 13 groundwater samples. Groundwater monitoring well locations are shown on Figure 4.

USEPA-approved groundwater sampling procedures and protocols were used in conducting the monitoring. Groundwater levels were measured within each monitoring well to determine groundwater elevations for the development of groundwater elevation contour maps, and to identify groundwater flow directions.

Prior to sampling of each monitoring well, a minimum of three well volumes of water were removed from the wells (unless the wells are recovery wells used for pumping groundwater), and disposed of through the facility treatment system. Samples for laboratory analysis were collected in laboratory-prepared VOA vials containing an appropriate amount of preservative. Vials were filled without headspace or air bubbles. Samples were packaged in shuttles containing ice packs for shipment to the analytical laboratory. Chain-of-custody protocol was strictly adhered to during all phases of sample collection, transportation and delivery to the laboratory. Antech Ltd. of Export, Pennsylvania, analyzed the groundwater samples.

During the October sampling event, four QA samples were collected. QA samples included a trip blank, an equipment blank, a blind duplicate sample from CMW-9, and a field blank. The trip blank was prepared by the analytical laboratory prior to shipping the sample bottles, and accompanied the sample bottles throughout the entire sampling process. The equipment blank was collected by pouring deionized water over sampling equipment after it had been decontaminated, and was collected to evaluate the effectiveness of the decontamination procedures. The duplicate sample was collected to evaluate laboratory analytical procedures. The field blank was collected to evaluate the ambient air conditions at the time of sampling.

3.0 FINDINGS

3.1 SYSTEM PERFORMANCE

The groundwater recovery system operated almost continuously during the second semiannual 2000 monitoring period. The remediation system was down between September 29 and October 2, 2000 for routine maintenance.

The recovery system treated and discharged over 43 million gallons of water during this reporting period (Table 4). As summarized in Appendix D, the average flow rates for the recovery system during the reporting period were approximately:

Shallow aquifer (interceptor trench)	1 gpm
Intermediate bedrock aquifer (R-2)	28 gpm
Deep bedrock aquifer (CMW-5-2A, CMW-5-11)	138 gpm

These flows were determined by totalizing flow meters at the treatment plant.

Based on these measurements, the average total pumping rate of the system was 167 gpm, which is below the KPDES permit limit of 250 gpm.

3.1.1 Influent Concentrations

Table 5 summarizes the analyses of untreated influent for the second half of 2000. Water quality was relatively consistent, with TCE concentrations ranging from 120 to 140 μg/l, 1,2-DCE ranging from 522 to 540 μg/l, and vinyl chloride ranging from 22 to 34 μg/l. Constituent concentrations in the influent have shown a general downward trend since implementation of the final RA system in February 1998 (Figure 9).

3.1.2 Effluent Quality

System effluent concentrations for the reporting period are summarized in Table 5. All measurements of 1,2-DCE, TCE, and vinyl chloride complied with the KPDES permit effluent limits for the daily maximum. Furthermore, monthly average concentrations complied with the monthly average limit specified in the permit. The average removal efficiency for the air stripper was approximately 94% (Table 5).

3.1.3 Contaminant Removal

Table 4 indicates that approximately 156 pounds of VOCs were removed from the groundwater system during the second half of 2000. This total includes 119 pounds of 1,2-DCE, 31 pounds of TCE, and 6 pounds of vinyl chloride. Since 1993, when the first groundwater recovery system was started, approximately 1,053 pounds of VOCs have been removed (Appendix D).

3.1.4 Offgas Treatment

Table 6 summarizes analyses of the air stripper exhaust gas (cat-ox influent) and the cat-ox air stack effluent for the reporting period. Concentrations in all samples were well below the standards established by EPA in the ROD. Because the untreated air meets the required emission standards and is less than 4% of the EPA air emission limit, Cooper believes operation of the cat-ox unit should be discontinued and will request permission from EPA in the future to discontinue operation of the cat-ox unit. Cooper is investigating reducing the propane fuel costs by lowering the flame temperature, since the cat-ox is operating so efficiently without sacrificing air quality.

The cat-ox treatment system removed nearly 100% of the contaminants of interest from the air stream.

3.2 GROUNDWATER FLOW

Groundwater level measurements were obtained from 21 monitoring wells during this semiannual monitoring event (Table 7).

The groundwater elevations were used to generate groundwater contour maps of the shallow, intermediate and deep aquifers. Groundwater flow in the shallow aquifer shows the effects of the recovery trench (Figure 5), with the trench capturing groundwater in the central portion of the facility. Outside of the radius of influence of the recovery trench, groundwater flows easterly toward the Cumberland River.

Data for the intermediate aquifer during this reporting period (Figure 6) are insufficient for preparation of accurate contours. However, historic data have demonstrated that a capture zone has been developed around intermediate pumping well R-2. The Semi-Annual Remedial Action Status Report for the first half of 2001 will include groundwater contours on the intermediate aquifer.

Data for the deep aquifer (Figure 7) indicates the presence of an elongated cone of depression surrounding the deep pumping wells, CMW-5-2A and CMW-5-11, and extending toward wells CMW-12 and CWM-8S. This flow pattern indicates capture of contaminants in the deeper zone.

3.3 CONTAMINANT REMOVAL RESULTS

The analytical results for the well and trench samples are summarized on Table 8 and Figure 8. The complete analytical report is presented in Appendix B. Samples were collected from the interceptor trench in the shallow aquifer, recovery well R-2 in the intermediate aquifer, and two pumping wells (CMW-5-11 and CMW-5-2A) in the deeper aquifer. TCE, 1,2-DCE, and vinyl chloride were detected at concentrations substantially above their MCLs in the intermediate and deep wells, with the exception that the TCE concentration in well CMW-5-11 was below its MCL. The trench contained TCE at levels well above its MCL and 1,2-DCE at levels slightly above its MCL.

Acetone was detected at very low concentrations in some of the samples. However, this constituent is not historically associated with the site and was detected in blank samples (Table 9), indicating a laboratory artifact.

Consistent with previous sampling data, the presence of 1,2-DCE and vinyl chloride indicate the probable presence of natural biodegradation processes occurring in the aquifer.

Contaminant concentration levels in the air stripper influent water through time are summarized on Figure 9. Influent water quality for the treatment system has exhibited a decreasing trend since the final remediation system was started up in February 1998; however, concentrations have leveled off since June 1999. This decrease in effectiveness through time is typical of pump and treat systems, and is related to the logarithmic concentration profile of contaminant plumes

3.4 OFFSITE GROUNDWATER QUALITY

The second semiannual sampling results are summarized in Table 8 and Figure 8. Complete analytical results are presented in Appendix B. Offsite wells sampled during the reporting period were:

CMW-6	CMW-7	CMW-9
CMW-12	CMW-12-16	CMW-13
CMW-85		

Concentrations of constituents in excess of MCLs were not detected in any of the offsite wells except for wells CMW-7 and CMW-12. TCE, 1,2-DCE and vinyl chloride were detected in well CMW-7 above their MCLs. Only 1,2-DCE and vinyl chloride were detected slightly above the MCLs in well CMW-12.

The detection of vinyl chloride in CMW-9 at its MCL of 2 μg/l is consistent with sporadic historic detections of this constituent in the well (Appendix C).

3.5 TIME TRENDS

Water quality data for the influent groundwater and wells CMW-5-2, CMW-5-11, CMW-7, and CMW-12 were reviewed for trends (Figures 9 through 13). The historic analytical database for the site is presented in Appendix C.

The cumulative VOC mass recovered is shown on Figure 14. The trend of continuous increase clearly indicates the effectiveness of the system in removing VOCs.

3.6 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

Analytical results for quality assurance samples are presented in Table 9. Low levels of acetone and methylene chloride were detected in blank samples. Concentrations of these parameters were similar in some of the groundwater samples, indicating that the detections of acetone and methylene chloride in the groundwater samples may not be reliable.

The results for CMW-9 and the blind duplicate show very good agreement.

4.0 SUMMARY

4.1 TREATMENT SYSTEM

The groundwater treatment system continues to be effective at removing VOCs from the groundwater extracted from the shallow, intermediate, and deep aquifer recovery systems. Approximately 43 million gallons of impacted groundwater were removed during this period, at an average combined flow of 167 gpm. A total of 156 pounds of VOCs were removed from the shallow, intermediate and deep aquifer zones. Since the startup of the final RA system in February 1998, approximately 1,056 pounds of VOCs have been removed.

During the reporting period, the air stripper system operated at nearly 94% removal efficiency. The analytical results of effluent water samples collected from air stripper outfall 0001 were within KPDES compliance limits.

The offgases from the air stripper were treated through a catalytic oxidation system. The catalytic oxidation system removed almost 100% of the influent gases of concern (1,2-DCE, TCE, and vinyl chloride). Influent, as well as effluent, air emission analytical results met the required EPA air emission standards for the compounds of concern.

4.2 GROUNDWATER FLOW

The groundwater contour maps generated for the shallow and deep aquifers indicate that the recovery system is effectively capturing the contaminated groundwater. In the shallow aquifer, the groundwater appears to be captured by the trench system. In the intermediate aquifer, data are insufficient for preparation of accurate contours, but historic data demonstrate capture at this level. The capture zone developed in the deep zone extends beyond the leading edge of the plume in this zone. This finding indicates that the system is not only controlling the plume's movement, but is also retracting and remediating the remaining groundwater contamination.

4.3 ANALYTICAL RESULTS

Samples collected from the groundwater recovery extraction points (Trench, R-2, CMW-5-2A and CMW-11) and in the influent water to the air stripper detected the presence of elevated concentrations of 1,2-DCE, TCE, and vinyl chloride. The rates of concentration decreases have slowed somewhat since the final system started up in February 1998, as is typical of these systems; however, the cumulative mass of VOCs removed is still increasing (Figure 14). The presence of the degradation products of TCE (1,2-DCE and vinyl chloride) indicates that biodegradation is present in the aquifers and is actively supporting natural attenuation of the plume.

The groundwater samples collected from the offsite wells in the deep aquifer indicate that offsite migration of contaminants is being controlled and mitigated by the remediation system. The only offsite wells exhibiting constituent concentrations in excess of the MCLs were wells CMW-7 and CMW-12.

5.0 CONCLUSIONS

The groundwater recovery system is effectively removing contaminants from the impacted shallow, intermediate, and deep aquifers. The system also appears to be controlling the offsite migration of the contaminants and retracting the contaminant VOC plume. Water-quality data show that natural attenuation is occurring.

The continued operation of the groundwater remediation treatment system along with the monthly monitoring and maintenance of the remediation system will continue to remediate the aquifers and prevent offsite VOC contaminant migration.